

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Claims 1-10 (Canceled).

Claim 11 (Currently Amended): A frequency converter comprising:

a first transconductance unit that outputs a first output signal based on a first input signal having a first frequency;

a ~~first impedance matching unit that includes at least one~~ first inductor through which the first output signal passes;

a first current switching unit that converts the first output signal ~~output from passing through the first impedance matching unit inductor~~ to a second output signal having a second frequency based on a local oscillator signal, the first inductor being connected between the first transconductance unit and the first current switching unit;

a second transconductance unit that outputs a third output signal based on a second input signal having a phase that is opposite to a phase of the first input signal;

a ~~second impedance matching unit that includes at least one~~ second inductor through which the third output signal passes; and

a second current switching unit that converts the third output signal ~~output from passing through the second impedance matching unit inductor~~ to the second output signal based on the local oscillator signal, the second inductor being connected between the second transconductance unit and the second current switching unit.

Claim 12 (Original): The frequency converter according to claim 11, further comprising a current source that is commonly connected to the first and second transconductance units.

Claim 13 (Original): The frequency converter according to claim 11, wherein the first and second inductors are formed as a part of a monolithic integrated circuit.

Claim 14 (Currently Amended): The frequency converter according to claim 11, ~~wherein each of the first and second impedance matching units includes further at least one capacitor~~ further comprising:

a first capacitor connected to the first inductor in parallel; and

a second capacitor connected to the second inductor in parallel.

Claim 15 (Currently Amended): The frequency converter according to claim 11, wherein

the first transconductance unit includes a first transistor, ~~wherein~~ the first input signal is being input to a base of the first transistor, ~~and~~ the first output signal is being output from a collector of the first transistor, the collector of the first transistor being connected to one terminal of the first inductor,

the first current switching unit includes second and third transistors, ~~wherein the first output signal output from the first impedance matching unit is input to~~ emitters of the second and third transistors being connected to another terminal of the first inductor, ~~and~~ the local oscillator signal is being applied between bases of the second and third transistors,

the second transconductance unit includes a fourth transistor, ~~wherein~~ the second input signal is being input to a base of the fourth transistor, ~~and~~ the third output signal is being output from a collector of the fourth transistor, the collector of the fourth transistor being connected to one terminal of the second inductor, and

the second current switching unit includes fifth and sixth transistors, ~~wherein the third output signal output from the second impedance matching unit is input to~~ emitters of the fifth and sixth transistors being connected to another terminal of the second inductor, a base of the first transistor being connected to a base of the sixth transistor, a base of the second transistor being connected to a base of the fifth transistor.

Claim 16 (Currently Amended): The frequency converter according to claim [[15]] 11, ~~wherein the first impedance matching unit comprises~~ further comprising:

a first capacitor having two terminals, one terminal of the first capacitor being connected to ~~the emitters of the second and third transistors and~~ one terminal of the first inductor, another terminal connected to the earth;

a second capacitor ~~having two terminals,~~ one terminal of the second capacitor being connected to ~~the collector of the first transistor and~~ another terminal of the first inductor, another terminal of the second capacitor being connected to the earth; and

~~a first inductor having two terminals, one terminal being connected to the emitters of the second and third transistors and another terminal being connected to the collector of the first transistor,~~

~~the second impedance matching unit comprises~~

a third capacitor ~~having two terminals~~, one terminal of the third capacitor being connected to ~~the emitters of the fifth and sixth transistors and~~ one terminal of the second inductor, another terminal of the third capacitor being connected to the earth; and

a fourth capacitor ~~having two terminals~~, one terminal of the fourth capacitor being connected to ~~the collector of the fourth transistor and~~ another terminal of the second inductor, another terminal of the fourth capacitor being connected to the earth; and

~~a second inductor having two terminals, one terminal being connected to the emitters of the fifth and sixth transistors and another terminal being connected to the collector of the fourth transistor.~~

Claim 17 (Currently Amended): The frequency converter according to claim 14, ~~the inductors and the capacitors~~ wherein the first inductor, the second inductor, the first capacitor, and the second capacitor are formed as a part of a monolithic integrated circuit.

Claim 18 (Currently Amended): The frequency converter according to claim ~~[[14]]~~ 17, wherein ~~each of the first and second impedance matching units is a parallel resonant circuit that includes the inductor and the capacitor, wherein the inductor and the capacitor are formed as a part of a monolithic integrated circuit~~ the first inductor and the first capacitor constitute a first parallel resonant circuit, and

the second inductor and the first capacitor constitute a second parallel resonant circuit.

Claim 19 (Currently Amended): The frequency converter according to claim 18, wherein the first parallel resonant circuit and the second parallel resonant circuit each have

has a resonance frequency that is two times or more of a frequency of the local oscillator signal.

Claim 20 (Currently Amended): The frequency converter according to claim 18, wherein the first parallel resonant circuit and the second parallel resonant circuit each have has a resonance frequency that is represented approximately by $3\omega_1 \pm \omega_2$ where ω_1 is a frequency of the local oscillator signal and ω_2 is the second frequency.

Claim 21 (Currently Amended): The frequency converter according to claim 18, wherein the first parallel resonant circuit and the second parallel resonant circuit each have has a resonance frequency that is represented approximately by $2\omega_1 \pm \omega_2$ where ω_1 is a frequency of the local oscillator signal and ω_2 is the second frequency.

Claim 22 (Canceled).

Claim 23 (Currently Amended): A ~~frequency converter~~ radio communication apparatus comprising:

a first frequency converter including

a first transconductance unit that outputs a first output signal based on a first input signal having a first frequency;

~~a first impedance matching unit that includes at least one~~ first inductor through which the first output signal passes;

a first current switching unit that converts the first output signal ~~output from~~ passing through the first ~~impedance matching unit inductor~~ to a second output signal

having a second frequency based on a local oscillator signal, the first inductor being connected between the first transconductance unit and the first current switching unit;

a second transconductance unit that outputs a third output signal based on a second input signal having a phase that is opposite to a phase of the first input signal;

~~a second impedance matching unit that includes at least one~~ second inductor through which the third output signal passes; and

a second current switching unit that converts the third output signal ~~output from passing through the second impedance matching unit inductor~~ to the second output signal based on the local oscillator signal, the second inductor being connected between the second transconductance unit and the second current switching unit,

a second frequency converter including

a third transconductance unit that outputs a fourth output signal based on a third input signal having the second frequency;

~~a third impedance matching unit that includes at least one~~ third inductor through which the fourth output signal passes;

a third current switching unit that converts the fourth output signal ~~output from the third impedance matching unit inductor~~ to a fifth output signal having the first frequency based on the local oscillator signal, the third inductor being connected between the third transconductance unit and the third currently switching unit;

a fourth transconductance unit that outputs a fifth output signal based on a fourth input signal having a phase that is opposite to a phase of the third input signal;

~~a fourth impedance matching unit that includes at least one~~ fourth inductor through which the fifth output signal passes; and

a fourth current switching unit that converts the fifth output signal ~~output from~~
passing through the fourth ~~impedance-matching unit~~ inductor to the fourth output
signal based on the local oscillator signal, the fourth inductor being connected
between the fourth transductance unit and the fourth current switching unit;

a signal generating unit that generates the first and second input signals, outputs the
first input signal to the first transconductance unit of the first frequency converter, and
outputs the second input signal to the second transconductance unit of the second frequency
converter;

a receiving unit that receives a signal output from any one of the third and fourth
current switching units of the second frequency converter; and

an antenna that receives a signal corresponding to any one of the third and fourth
input signals, outputs the signal received to any one of the third and fourth transconductance
units of the second frequency converter, and transmits a signal output from any one of the
first and second current switching units of the first frequency converter.